

Aerogel-Filled Foam Core Insulation for Cryogenic Propellant Storage, Phase II

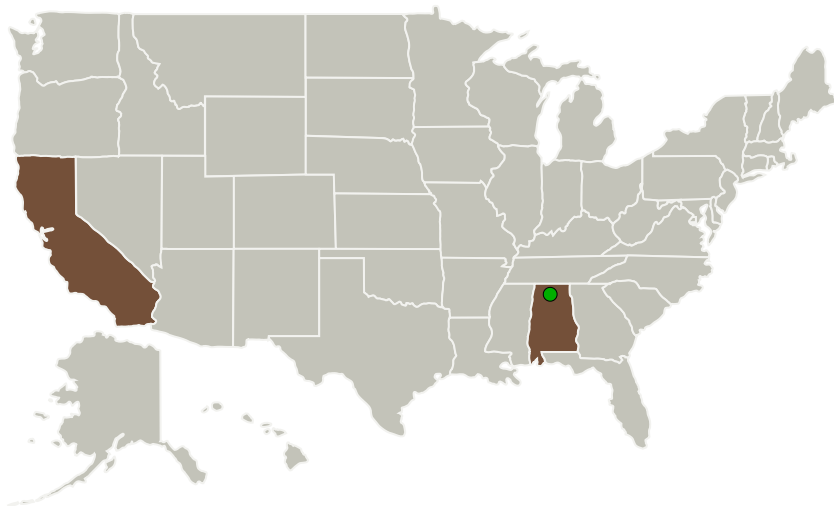
Completed Technology Project (2011 - 2014)



Project Introduction

Current cryogenic insulation materials suffer from various drawbacks including high cost and weight, lack of structural or load-bearing capability, fabrication complexity, and property anisotropy. A need clearly exists for lightweight thermal insulation that is isotropic and structurally capable with high thermal performance, while also offering reduced fabrication and installation complexity and lower cost. In previous work for NASA and DoD involving lightweight structural insulation for high temperature engine and airframe applications, Ultramet developed and demonstrated lightweight open-cell foam insulators composed of a carbon or ceramic structural foam skeleton filled with a low-cost, nanoscale aerogel insulator. The potential exists to adapt and optimize aerogel-filled structural foam for the cryogenic insulation application, taking advantage of the thermal and mechanical benefits of each component while offering low cost and manufacturability in complex shapes. In Phase I, the feasibility of fabricating aerogel-filled open-cell foam for cryogenic application was demonstrated, initial thermal performance was established, and a path for continued material and structural optimization was developed through design and modeling. In Phase II, Ultramet will again team with Ocellus, a leader in low-cost aerogel fabrication, and Materials Research and Design for design and analysis support. Thermal performance will be characterized at the Cryogenics Test Laboratory at Kennedy Space Center.

Primary U.S. Work Locations and Key Partners



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Organizations Performing Work	Role	Type	Location
Ultramet	Lead Organization	Industry	Pacoima, California
● Marshall Space Flight Center(MSFC)	Supporting Organization	NASA Center	Huntsville, Alabama

Primary U.S. Work Locations	
Alabama	California

Project Transitions

August 2011: Project Start

June 2014: Closed out

Closeout Documentation:

- Final Summary Chart(<https://techport.nasa.gov/file/138804>)

Organizational Responsibility

Responsible Mission Directorate:

Space Technology Mission Directorate (STMD)

Lead Organization:

Ultramet

Responsible Program:

Small Business Innovation Research/Small Business Tech Transfer

Project Management

Program Director:

Jason L Kessler

Program Manager:

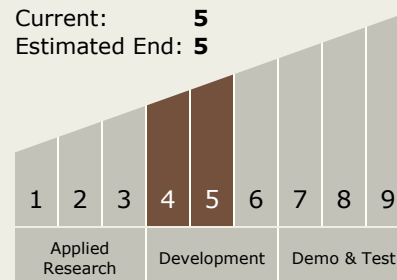
Carlos Torrez

Principal Investigator:

Victor M Arrieta

Technology Maturity (TRL)

Start: 4
Current: 5
Estimated End: 5



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Technology Areas

Primary:

- TX14 Thermal Management Systems
 - └ TX14.1 Cryogenic Systems
 - └ TX14.1.4 Ground Testing & Operations

Target Destinations

The Moon, Mars, Outside the Solar System, The Sun, Earth, Others Inside the Solar System